

JIHOČESKÁ UNIVERZITA V ČESKÝCH BUDĚJOVICÍCH
PEDAGOGICKÁ FAKULTA



BAKALÁŘSKÁ PRÁCE

JIHOČESKÁ UNIVERZITA V ČESKÝCH BUDĚJOVICÍCH
PEDAGOGICKÁ FAKULTA

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Bakalářská práce

**Srovnávací analýza anglicky psaného ekonomického a neekonomického
textu**

Contrastive analysis of Economic and Non- Economic Text

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Prohlášení

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České Budějovice

1. prosince 2006

A handwritten signature in cursive script, reading "Michaela Brunová", written over a horizontal line.

podpis

Poděkování

Za pomoc při psaní této bakalářské práce bych chtěla poděkovat především Mgr. Petru Dvořákovi, který mě vedl správným směrem a poskytl mi množství cenných rad a také mé rodině, která mi studium umožnila a po všech stránkách mne podporovala.

Anotace

Tématem této bakalářské práce je analýza dvou textů, z nichž jeden je text ekonomický a druhý neekonomický. Jako text ekonomický jsem vybrala odbornou zprávu (Technical Report), která pojednává o funkci jaderného reaktoru. Do kontrastu stavím neekonomický text uspořádaný z článků o partnerských vztazích. Texty analyzuji po stránce morfologické, syntaktické, lexikální a stylistické. Práce je rozdělena na dvě základní části - teoretickou a praktickou. Teoretická část je věnována hlavně obecné charakteristice odborného psaní, popisují základní rozdíly mezi ekonomickými a neekonomickými texty. Osvětluji v ní význam a užití odborné zprávy. Předběžně nastíním všeobecně platné znaky jazykových skupin. Zde si čtenář může udělat obrázek o tom, čím se taková technická zpráva liší od neodborného textu. Zda-li je tato předzvěst pravidlem či nikoliv, o tom se přesvědčí v praktické části, kde se již dostávám ke konkrétní analýze a opět rozebírám již zmíněné podskupiny.

Každé podskupině patří svůj závěr, ve které jsou zpracovány výsledky jednotlivých analýz. Ty potvrzují pravdivost teoretické části, nebo ji naopak vyvrací. Celkový závěr také demonstruje konkrétní odchylky.

Abstract

The thesis is aimed at the analysis of two texts, one of them is economic and the second one is non-economic. As an economic text I have chosen a Technical Background Report that deals the function of nuclear reactor. Into the contrast I place a non-economic text whose topic are relationships. I analyse them from the point of view of morphology, syntax, lexicology and stylistics. The thesis is divided in two basic parts – theoretical and practical one. The theoretical part applies to the general characteristics of technical writing and describes basic differences between economic and non-economic texts. I clarify the meaning and the usage of technical report. Tentatively I outline typical features of each language group. The reader can conceive of how the technical report differs from a non-technical text. If the indication are correct or not, we can convince ourselves about it in the practical part, where I get to the specific analysis and describe each language group.

Each part ends with its own conclusion, where the results of each individual analysis are summed up. They confirm the veracity of theoretical part or on the contrary they refute it.

Further in the final summary the differences with the theoretical part are demonstrated.

Contents:

Introduction	6
I. THEORETICAL PART	7
I.1. About technical writing	7
I.2. Syntax	8
I.3. Lexicology	9
I.4. Morphology	9
I.5. Types of technical writing	10
I.6. Differences between technical and non technical writing	10
I.6.1. Characteristics of effective technical writing	11
I.7. About Technical Report	12
I.7.1. Types of technical report	13
I.7.2. Technical background report	13
II. PRACTICAL PART	14
II.1. Morphology	14
II.1.1. Genus Verbi	14
II.1.2. Tenses	15
II.1.3. Modus	17
II.1.4. Modal verbs	17
II.1.5. Auxiliary verbs	18
II.1.6. Ellipsis	19
II.1.7. Case	19
II.1.8. Conclusion	19
II.2. Syntax	21
II.2.1. Basic Parts of the sentence	21
II.2.1.1. Subject and its realization	21
II.2.2. Basic Sentence Patterns and Types	21
II.2.2.1. Simple sentence	21
II.2.2.2. Compound Sentence	22
II.2.2.3. Complex sentence	23
II.2.2.4. Compound complex sentence	24
II.2.2.5. Semi- clauses	26
II.2.2.5.1. Infinitiv	26

222.5.2. Gerund	28
223. Conclusion	30
23. Lexicology	31
23.1. Technical terminology	31
23.2. Terminology of non-economic text	32
23.3. Functional connotations, linking devices	32
23.4. Compound nouns	32
23.5. Phrasal verbs	34
23.6. Numbers, symbols	34
23.7. Analysis of vocabulary	34
23.8. Conclusion	36
24. Stylistics	37
24.1. Style of technical background report	37
24.2. Style of non-economic text	42
24.3. Conclusion	44
Conclusion	46
České résumé (Summary)	47
Information sources, literature	50
Supplement	51

Introduction

The topic of my thesis is an analysis of economic text and its comparison with a non-economic text. I have chosen this topic, because in the future I would like to translate for international companies, which requires the knowledge of technical writing. My current studies have already enabled me to work with this problems and I find it very interesting. The comparison of the text with the non-economic one I consider a useful aid in my thesis that can convince me of, if some usually used features (either grammatical or syntactical, lexical and stylistic) can also be used in the technical text. That is why my thesis does not represent only the analysis itself, but also is an instruction for right technical writing.

The thesis is divided in two basic parts – theoretical and practical one.

The theoretical part applies to the general characteristics of technical writing and describes basic differences between economic and non-economic texts. I clear up the meaning and the usage of technical report. Tentatively I outline the typical features of morphology, syntax, lexicology and stylistics generally valid, which also form subgroups in this theoretical part. The reader can conceive of how the technical report differs from a non-technical text. If the indications were correct or not, it can be found out in the practical part that follows. In this part I get to the concrete analysis and describe each subgroup.

In the syntactical part I implicate the characteristics of phrase structure of technical style, such as semi-clauses, types of sentences, etc. Lexicology represents a significant part because of the specific terminology and compound nouns that occur in the texts. I compare not only a basic vocabulary but also its possibility of use in other fields. Other part states grammatical features of sentence constructions, such a passive voice or modal verbs. The analysis of styles of both texts belongs to the most marked part of the thesis.

I hope that this thesis will help me to get new information and extend my knowledge and will contribute to the successful termination of my studies.

I. Theoretical part

1.1. About the style of Technical Writing

The style of science and technology represents the basic style of factual literature. It has a professional communicative function, where „professional“ generally means, because an administrative style is also professional. „Čeští stylisté rozlišují oblast, jíž odpovídá styl naukový, vědecký. J. Mistřík od staršího, obecnějšího označení „odborný“ vzhledem k stále větší diferenciaci uvnitř této rozsáhlé sféry ustupuje a používá termínů styl „administrativní“ a styl „naučný“, který dělí dále na větev vědeckou a větev populární.“¹

According to the Leipzig linguists the languages of technical and production fields represent very differential and manifold phenomena. During the last decades a technical language has differentiated more than a law language or the medical one. For example the language of the computer centre, nuclear reactor centre, factory producing machine tools or manufacture processing plastic materials always differs in comparison with the language of the salespeople in the companies of the same field. Today each field has its own terminology, but the differences are also in the syntax.

Thanks to the consistent usage of technical (science) terminology and well-elaborated syntax we reach more exact formulation. Especially the written form realizes technical style

(The lectures represent a secondary form of the realization of technical style), but as well as the administrative style this one is monotonous above all.

It follows an array of consequences from this feature. Because there is no feedback from the recipient, no situational context, the author cannot rely on the supporting role of intonation, gesture, and the expression must be complete on both content and formal side. Because the content tends to be conceptually difficult, the text must be clear linguistically and stylistically, so that the process of communication could be smooth without any complicatedness. For this reason the phrases must be organized, text divided and the sentences must link up. In the text we use connectors, demonstrative and reference expressions, subordinating conjunction, because with all this we can reach the hierarchy in the text. In the technical style it is necessary to express the relationships among the sentences, especially the circumstance ones.

¹ D. Knittlová-Teorie překladu, p. 81

11.2. Syntax

In other respects the syntax is relatively poor. „ Odpadá jiný než objektivní pořádek slov, odpadá střídání slovesných aktualizačních kategorií, střídání osobních zájmen, nepoužívá se neobvyklých nebo expresivních konstrukcí. Věty jsou podobně jako v administrativním stylu poměrně uzavřené celky s logickou pevnou kostrou, s koncentrovanou skladbou, která je do značné míry stereotypní. Podoba vět (zejména anglického vědeckého stylu) se schematizuje. Přísná objektivita, která je nedílnou součástí vědeckého stylu, vyžaduje neosobní konstrukce a pasívum. „²

Vedle neosobnosti je nejmarkantnějším skladebním rysem vědeckého stylu přesná formulace a logický sled vět, mezi nimiž je jasný vzájemný vztah a závislost. Zvlášť časté a důležité jsou navazovací formule, velkou frekvenci je především *thus, however, therefore*, ale velmi běžně se objevuje také *moreover, the, furthermore, so, in addition, on the other hand, nevertheless, again, also, yet, still, meanwhile*..aj. Jejich významový okruh je velmi široký. Now může znamenat i dále, a tak, v dané práci, v následujícím textu apod., odráží tedy etapy logického výkladu jako navazovací prostředek logického sledu myšlenek. Tentýž úkol plní i některá sousloví jako *in fact, in general, in short, in this way* apod. Nejsou to prostředky typické pouze pro vědecký styl, ale většina vět ve vědeckém stylu je konstruována uvedeným způsobem. Těsnost vazby jednotlivých částí textu závisí do jisté míry také na typu vědeckých textů (v přírodních vědách je větší než ve vědách společenských).

S přísnou logickou návazností vět souvisí také uspořádání větných členů, případně vět uvnitř souvětí. Vědecký styl postupuje vždy od známého tématu, nositele logického subjektu, prvku nepřinášejícího novou informaci, ale naopak navazujícího na dříve řešené nebo známé z kontextu či ze situace k rématu, nositeli logického přísudku, větnému členu přinášejícímu maximální informaci. Velká většina vět ve vědeckém stylu nezačíná podmětem, ale jinými větnými členy, ať už okolnostním určením (času, místa, způsobu, účelu) včetně příslovečných vět vedlejších nebo polovětných vazeb, či předmětem nebo doplňkem. -Místo podmětu v čele věty je však tak silné, že i okolnostní určení zejména místa se v anglickém vědeckém stylu často stává podmětem.“³

² D. Knittlová-Teorie překladu, p.81

³ D. Knittlová-teorie překladu, p. 86

1.3. Lexicology

„Požadavku rychlého, hutného a přesného přenášení myšlenek vyhovuje rovněž výběr lexikálních prvků. Vědecký styl je pojmový, typickým slovním druhem jsou substantiva, popřípadě adjektiva, a převahu mají odborné výrazy, které se pečlivě volí, aby byly jednoznačné (nikoliv nutně jednovyznamové). Výrazů subjektivních a expresivních se nepoužívá. Čím je styl vědecktější, tím užší jsou termíny (velmi zřetelné je to v logice a matematice). V jednotlivých vědních oborech a jejich projevech vystačíme s poměrně skromným výsekem lexikálního repertoáru, takže index opakování je dost vysoký, podle přízkumu při porovnání s ostatními funkčními styly vůbec největší. Slovník je tedy stereotypní podobně jako syntax, ale ani v jednom ani v druhém případě to není rys negativí, naopak stereotyp vyhovuje funkci tohoto stylu a je výhodný i pro strojovou techniku a pro snadnější, přesné a jednoznačné prozumění cizojazyčnému vědeckému stylu.

Jelikož hlavním zájmem vědeckého sdělení po jazykové stránce je definovat přesně věci a jasně a logicky skloubit myšlenkový proces, základním slohovým postupem je výklad, při němž se problém vysvětluje, objasňuje, uvádějí se argumenty, příklady, přistupuje se přísně logicky. Strukturou jsou útvary vědeckého stylu méně disparatní, liší se rozsahem, ale obsahově a formálně jsou vždy koncentrované, kompaktní.“⁴

1.4. Morfology

„Ve vysoké míře se objevuje neosobnost, neosobní prezentování informace, které je příznačné pro exaktní vědy. Osoba autora je potlačena a sdělení je soustředěno na popisovaná fakta a jevy. K tomu nejúčinněji slouží *pasivum*, které má ve vědeckém stylu, a zejména v oblasti exaktních věd, nejbohatší uplatnění.

Zevrubně se touto problematikou zabývá L. Dušková v článku „On some functional and stylistic aspects of the passive voice in present-day English“. Výhodou pasiva je, že nemusí specifikovat konatele. Používá se ho tedy především tam, kde chceme, aby implikovalo neurčitého všeobecného konatele.

V neosobních větách se často vyskytují modální slovesa (must, should, ought, can, may, might). Příznačné pro ně je, že ztrácejí v menší nebo větší míře svůj lexikální význam,

⁴ D. Knittlová - Teorie překladu, p. 81

průměrný stupeň oslabení významu závisí na tom, s jakým plnovýznamovým slovesem se kombinují. Podle J.A. Zverevy nejvíce ztrácejí svůj lexikální význam se slovesy *to note, to notice, to remark, to observe, to mention*, částečně s *to say*. Je tu možno mluvit až o jakémsi obecně modálním významu, těžko se dá vysvětlit nějaký určitý modální významový odstín, jde spíše o vyjádření hypotetického děje, o oslabení obecné platnosti výroku. Přitom tato modalita nespecifikovaná modalita naznačuje subjektivní postoj mluvčího k sdělovaným faktům, jde o modalitu objektivizovanou, což je v souladu s objektivizací vědeckého stylu.

Example: It may be noticed...- It should be noted...⁵

1.5. Types of technical writing

- | | |
|----------------------------|------------------------------------|
| -Business letters | • Operational guides |
| -Presentation materials | • Press Releases |
| -Newsletters | • Web pages |
| -Web applications | • Travel guides |
| -Scripts | • Training materials |
| -Meeting minutes | • Advertising copy |
| -Magazine articles | • Instructional posters |
| -Resumes and cover letters | • Contracts, proposals, and grants |
| -Feasibility reports | • Procedures |
| -Questionnaires and forms | • Scientific papers |
| -Data books and catalogues | • Cookbooks |

1.6. Differences between technical and non-technical writing

Writing can be grouped into five basic types: technical, creative, expressive, expository and persuasive. To help to understand technical writing, it may help to compare it to other types:

Technical writing conveys specific information about a technical subject to a specific audience for a specific purpose.

Creative writing is fiction – poetry, short stories, plays, and novels – and is most different from technical writing.

⁵ J. Knittlová-Teorie překladu, str.82, 83

Expressive writing is a subjective response to a personal experience – journals and diaries-whereas technical writing might be objective observations of a work – related to experience or research.

Expository writing „exposes“ a topic analytically and objectively, such as news reports. Like technical writing, the goal of expository writing is to explain or reveal knowledge, but expository writing does not necessarily expect a response or action from the reader.

Persuasive writing depends on emotional appeals. Its goal is to change attitudes or motivate to action.

	Technical Writing	Non-technical writing
Content	Factual, straight-forward	Imaginative, metaphoric or symbolic
Audience	Specific	General
Purpose	Inform, instruct, persuade	Entertain, provoke, captivate
Style	Formal, standard, academic	Informal, artistic, figurative
Tone	Objective	Subjective
Vocabulary	Specialized	General, evocative
Organization	Sequential, systematic	Arbitrary, artistic

1.6.1. Characteristics of Effective Technical Writing

Technical writing usually requires action, follow-up, dialog, or input from the audience. Therefore, effective technical writing is clear, accurate, and correct. Because technical writing is seldom read from beginning to end, like a novel generally is, the various sections must be easily accessible and well organized. And while technical writing needs to be comprehensive, it is also concise and carefully worded.

Clear—is easily understood by the intended audience without ambiguities.

Accurate—is factual, correct, free from bias.

Correct—follows both grammatical and technical conventions.

Comprehensive—contains all necessary information.

Concise—is clear and complete without excess or redundant verbiage.

Accessible—includes headings and sub-headings, indexes, and table of contents.

11.7. About the Technical Report

In my work I will be analysing the Technical report, which belongs to the technical writing. Just about everything I study, everything I write, is geared toward preparing me to write this final report. The early, short assignments involving instructions or descriptions and the like, give me practice using headings, lists, notices, and graphics; in handling numbers and abbreviations; and of course in producing good, clear, well-organized writing.

For many students, the technical report is the longest document they've ever written. It normally involves some research; often the information comes not only from published sources in the library, but also sources outside the library, including non-published things such as interviews, correspondence, and videotapes. It may also be the fanciest document: it uses binding and covers and has special elements such as a table of contents, title page, and graphics.

„As you think about what you want to write about for this project, don't shy away from topics you are curious about or interested in, but don't know much about. You don't need to do exhaustive research; normally, you can pull together information for an excellent report from several books and half-dozen articles. Your real focus is on the writing: how well it is adapted to a specific audience, how clear and readable it is, how it flows, how it's organized, how much detail it provides. You are also focused on the format: how well you use headings, lists, notices; how well you incorporate graphics; how well you handle the front- and back-matter elements; and how nice a job you do of turning out the final copy of the report."

You don't need to be a trained graphic designer to produce a fine-looking report. Basic word-processing skills and a decent printer and access to nice (but inexpensive) binding are all you need."⁶

⁶www.io.com

1.7.1. Types of Reports

There are several types of technical report, such as technical background reports, Primary Research Reports, Business Plans, Technical Specifications, Report-length proposal... For my work I have chosen to analyse the technical background report.

1.7.2. Technical Background Report

"The technical background report is hard to define – it's *not* a lot of things, but it's hard to say what it is. It doesn't provide step-by-step directions on how to do something the way that instructions do. It does not formally provide recommendations the way that feasibility reports do. It does not report data from original research and draw conclusions, the way that primary research reports do.

So what does the technical background report do? "It provides information on a technical topic but in such a way that is adapted for a particular audience that has specific needs for that information. Imagine a topic like this: renal disease and therapy. A technical background report on this topic would not dump out a ten-ton textbook containing everything you could possibly say about it. It would select information about the topic suited to a specific group of readers who had specific needs and uses for the information. Imagine the audience was a group of engineers bidding on a contract to do part of the work for a dialysis clinic. Yes, they need to know about renal disease and its therapy, but only to the extent that it has to do with their areas of expertise. Such a background report might also include some basic discussion of renal disease and its treatment, but no more than what the engineers need to do their work and to interact with representatives of the clinic.

Typical content and organization of technical background reports. Unlike most of the other reports discussed, the technical background report does not have a common set of contents. Because it focuses on a specific technical topic for specific audiences who have specific needs or uses for the information, it grabs at whatever type of contents it needs to get the job done. You use a lot of intuition to plan this type of report. For example, with the report on renal disease and treatment, you'd probably want to discuss what renal disease is, what causes it, how it is treated, and what kinds of technologies are involved in the treatment."⁷

⁷ www.io.com/~hcexres/textbook/techreps.html

II. Practical Part

2.1. Morphology

2.1.1. Genus verbi

Passive voice pattern.

The passive voice is not ordinarily considered a "pattern," but it is an important and often controversial construction. It reverses the subject and object and, in some cases, deletes the subject. Technical report consists of many passive clauses in the comparison with non-economic text.

TR: Both types of light water reactors are described, and an explanation of how each reactor produces electricity is presented.

...water is used as both a coolant and a moderator.

...steam is produced in a secondary system.

The pressure is lowered...

...it is separated from the coolant.

Safety system is designed to prevent meltdown in both types of light water reactors.

The economics of a nuclear power plant are determined by the busbar cost and the operating capacity costs

WEI: They will be touched.

This theory is based on the hypothesis...

...men were tasked

Active voice

NET: Many men also engage in affairs because doing so is an ego boost for

them.

They take pride in the ability to attract women and don't care about the fact that doing so may destroy their relationship.

21.2 Tenses

Present simple

TE: The steam then flows through steam dryers where additional drying is done, and then it proceeds to turn a turbo generator.

NET: They take pride in the ability to attract women and don't care about the fact that doing so may destroy their relationship.

Present continuous

TE: I am submitting the accompanying technical background report entitled Light Water Nuclear Reactors.

Members who are considering membership....

The city council is currently investigating the possibility

NET: your partner is cheating on you.

your partner is having an affair.

the initial excitement you experienced is starting to waiver...

Present perfect. There is a higher occurrence of this tense in NET.

NET: ...where they have been

if you have been in your current relationship.

that you have never visited

TR: *these aspects of the discussion have been avoided*

- past simple

NET: *.. as it was in the beginning.*

- Past perfect

NET: *If you had planned...*

- Future simple

TR: *The final section will review the various costs*

the mechanical operation of the reactor will be presented

NET: *...you'll find your relationship taking a turn for the better*

This new interaction will help to pull you out of a rut.

your partner happy will let them know

that he will find the excitement he desires elsewhere.

In the case of TR the usage of tenses is mostly monotonous, although the reader can come across a few types of tenses. The whole text is presented mainly in present simple, other tenses are not frequented, they occur no more than once. On the other hand in NET we come across the variety of tenses, that repeats often. Good instruction writing not only requires special techniques but also clear, simple writing. Sentence clarity and economy is very important. The description in the TR does not need a variety of tenses, because it tells the readers how something is constructed, how it works and perhaps why it is used, that is why the present tense fulfils this requirement.

2.1.3. Modus

- Indicative

- TR: *There are approximately five hundred nuclear power plants in operation or under construction worldwide.*
- NET: *A kiss is still another way to bring the excitement back into your relationship.*

- Imperative

- NET: *Never underestimate the value of spontaneity in a relationship.*

Review the credit card bill each month.

Choose a romantic hotel, preferably one with a cosy restaurant.

Don't be afraid to suggest new activities.

- Conditional

There are two forms of conditional modus in English: the present and the past. In the NET we come across the first type especially. It is constructed by the verbs *should/would*.

- NET: *...you should make sure that before you begin your investigation.*

...a man should be able to control himself

2.1.4. Modal verbs

Modal verbs, such as *can, should, may, could*, occur only in the NET, in the TR there sometimes occurs a modal verb „*can*“.

NET:

Should: *...a man should be able to control himself*

Can: *A massage can be a very sensual and intimate experience.*

Could: ... a revelation that could put an end to the relationship.

May: Catching a cheating partner may not be a pleasant experience

TR:

Cam: These plants can produce as much as ...

These nuclear power plants can be categorized into four types.

The difference can be attributed to recent requirements

21.5 Auxiliary verbs

The usage of the auxiliary verbs is very low in TR, they hardly occur in the comparison with the NET.

-IS-

NET: ... schedule will enhance your relationship.

The relationship is starting to waiver ...

TR: I hope this report will prove to be satisfactory.

I am submitting the accompanying ...

-DO:

NET: Don't be afraid..., Being spontaneous doesn't have to involve big

decisions.

-HAVE:

NET: ... you have been in your current relationship.

You may have lavished gifts on your partner.

2.1.6. Inversion / ellipsis

The omission of a word or phrase necessary for a complete syntactical construction but ~~not~~ necessary for understanding.

NET: ...while enjoying each other's company – The subject is omitted.

~~Additionally~~ offering a massage..

~~Small,~~ meaningful gifts given just to make your partner happy.

TR: ...safety measures employed in these reactors...

~~...~~safety systems used in both types of reactors...

~~...~~various costs involved in the construction...

The ellipsis is used here in order to liven up the text. The meaning of ellipsis is ~~comprehensible~~, because the grammatical part that is missing can be easily inferred from the ~~situational~~ context.¹

2.1.7. Case

In both texts there is a big occurrence of **genitive** that is expressed by „of“.

-TR: purpose of this report, type of light water reactor, a review of the economic aspects of nuclear power plants, source of energy, category of nuclear power reactor....

-NET: be guilty of settling into, element of excitement, value of spontaneity, two of you, this aspect of your relationship, one night of fun

2.1.8. Conclusion

As it was already written in the practical part of my work, main grammar formula that occurs is passive voice. As we can see, the usage of passive voice in the technical report is ~~much~~ higher than in the non-economic text. Passive structures should be used only where they

¹ Úvod do anglické stylistiky, Ludmila Urbanová, p.62

have a specific encoding function, because otherwise they add unnecessarily to the complexity of a statement. Any feature of writing which doesn't have a communicative function should be deleted in informative writing. The common reason for using so many passive constructions is that they can be made impersonal. The active construction „*you strive to accomplish a goal together*“ can be transformed into an impersonal structure by the simple deletion of the last part of the sentence: „*a goal is striven to accomplish.*“ Because traditions of scientific and technical reporting seem to require impersonality, writers turn gratefully to the passive structure as an undemanding way of achieving the safety of facelessness.²

Other difference to see in the analysis is a usage of tenses. The main difference between both texts is that in the technical report the variety of usage of different tenses is very low in comparison with the non-economic text.

Modal verbs represent the question for itself. As it was said in the practical part, the usage of modal verbs is very common in the technical writing. The reason is simple; they help to express impersonality and express obligation. Surprisingly I have found many more modal verbs in the non-economical text. Why? In the non-economic text the usage of modal verbs is connected with the advice, instructions that are given to people for particular situations – what they should, may do. Verbs such as *should* reduce the instruction to the status of an observation. They appear to be passing information on, rather than instructing. Many modal verbs carry less than total obligation, because they express shades of obligation.³ I can confirm now, that what is typical for one style, can be used for other style as well.

Furthermore the obligation is usually represented by an imperative, which also appears in the style of technical writing very commonly: for example: *Keep the pressure constant*. Contrastively the imperative is used in the non-economic text because of the simple reason- it includes the instructions, how people should behave. The technical report is more about description and tells the reader, how something is constructed, which does not need the imperative but the indicative.

In both texts I have found a huge percentage of the genitive case represented by „of“. The Technical report is full of this grammar formula. Of-genitive leads to the nominal expression, which is to see in the technical report very commonly. Thank to the high usage of

²Effective writing, Christopher Turk and John Kirkman, second edition, 1992, p.111

³Christopher Turk-Effective writing, p.213

“off-genitive” the characteristic rules of technical style are observed. The text is predominantly conceptual, based on nominal and non-finite verb constructions and forms factual, economic expression, typical for technical style.

2.2. Syntax

2.2.1. Basic parts of the sentence

2.2.1.1. Subject and its realization

The subject of a sentence is that noun, pronoun, or phrase or clause about which the sentence makes a statement.

TR

- **noun:**... *The report concludes*
.. steam is produced
- **pronoun:**... *I am submitting the accompanying*
it flows to a series of steam
- **there:** *There are two types of light water reactors. There are approximately five*
hundred nuclear power plants.

NET

- **gerund:** *Being spontaneous doesn't have to involve...*
Exploring a new location together is another way...
Working together to learn a new skill will draw...
Spending a night at a hotel is another way...,
Setting the mood with candles and dim lighting is also suggested...
- **noun:** *As a relationship progresses...*
Intimacy is very important in a relationship.
- **pronoun:** *If you think..., it can be as simple as picking up...*
- **omitted subject:** *The following are a few tips for ensuring...*
- **demonstrative:** *This will give the two of you a chance.*

2.2.2. Basic Sentence Patterns and Types

2.2.2.1. Simple sentences. A simple sentence is one that contains subject and a verb and no other independent or dependent clause.

- Declarative Sentence

12. The low-pressure injection systems and the high-pressure injection systems also provide make-up water.

The main components of a pressurized water reactor are the core, control rods, reactor vessel, steam generators, and pressurizer.

The reactor vessel contains the fuel elements, the control elements, and the core monitoring instruments.

NET: Giving your mate gifts for no reason at all is another way to get your relationship back on track.

-Imperative Sentences: I have found the imperative sentences just in the NET.

NET: Don't be afraid to suggest new activities.

22.2.2. Compound sentences. A compound sentence is made up of two or more independent clauses joined by a coordinating conjunction (and, or, nor, but, yet, for) and a comma, an adverbial conjunction and a semicolon, or a semicolon. The independent clauses must be simple sentences.

12. Both types of light water reactors are described, and an explanation of how each reactor produces electricity is presented.

The core of a boiling water reactor is slightly larger than that of a pressurized water reactor but contains the same elements

The drywell encloses the reactor vessel, and the containment vessel encloses all the components of the reactor

A liquid, called the coolant, flows through the system and absorbs the heat produced in the core

The sections on the two types of light water reactors will describe the components and explain their operation

The core of a boiling water reactor is slightly larger than that of a pressurized water reactor but contains the same elements.

NET: As a relationship progresses one or both partners may be guilty of settling into complacency and may not strive to keep the element of excitement in their relationship

Don't be afraid to suggest new activities in your relationship or to try new things on a whim. Go all out getting yourself dressed up and take special care in your appearance.

You may have lavished gifts on your partner early in the relationship but as the relationship progressed you may not have done so as frequently.

They will be touched by the sentiment and will be happy to be sharing a sense of closeness with you again.

2.2.3. Complex sentences. A complex sentence contains at least one dependent clause (a noun, adjective, or adverb clause) and no more than one independent clause:

- **Attributive clauses:** There is a majority of the attributive sentences in the TR.

Light water reactors are a category of nuclear power reactor in which water is used as both a coolant and a moderator.

The core contains fuel assemblies that contain fuel rods filled with fuel pellets

The pressure is lowered and steam is allowed to form which then flows to a turbo generator where electricity is produced.

The passive system consists of accumulators, which inject coolant into the vessel when an accident occurs.

- **Clauses of place:**

The coolant flows through the core where it is heated at high pressure.

Then coolant then flows to a series of steam generators where the coolant flows through the heat exchangers and the steam drum.

The steam then flows through steam dryers where additional drying is done, and then it proceeds to turn a turbo generator

Clauses of time:

The control rods control the amount of nuclear fission reactions in the core while the pressurizer maintains the operating pressure in the reactor coolant system.

After steam is formed in the reactor vessel, it flows to a series of steam separators where it is separated from the coolant

The reactor core isolation cooling system pumps water into the reactor during a loss-of-coolant accident while the low and high-pressure core spray systems provide make-up water.

NET:

One may have gotten into the habit of giving your mate a kiss on the cheek or a quick peck on the lips when you see them after a long day of work.

This will give the two of you a chance to reconnect while enjoying each

other's company.

Offering your partner a massage when they are worn out and tired can also

bring the excitement back to your relationship.

12.2.4. Compound-complex sentences. A compound-complex sentence is made of two or more independent clauses and contains at least one dependent clause — in other words, a compound sentence with at least one dependent clause.

The water leaves the reactor to pass through steam generators where a secondary coolant is allowed to boil and produce steam to drive the turbine.

Both types of light water reactors are described, and an explanation of how each reactor produces electricity is presented

The pressure is lowered and steam is allowed to form which then flows to a turbo generator where electricity is produced

After steam is formed in the reactor vessel, it flows to a series of steam separators where it is separated from the coolant

NET:

Most relationships are very exciting in the beginning but if you have been in your current relationship for a while already you may have noticed that the initial excitement you experienced is starting to waiver and you and your partner may be settling into a dull routine.

Anything you do that is spontaneous may not work out as well as if you had planned out every last detail but just go with the flow and you'll find your relationship taking a turn for the better.

In the text there are mostly these sentences:

Conditional clauses:

NET:

If there is an activity that you both enjoy doing, make it something that the two of you do together often.

For example if you both enjoy hiking make plans to go hiking every Saturday morning and each time you go out make it a little different by exploring a new location or setting new goals for yourselves.

Object clauses:

If there is an activity that you both enjoy doing, ...

but it also lets your partner know that you want to be close to them at all

NET:

Clauses of manner:

Don't just schedule a night to go out to dinner but treat each of these date nights as if they were first dates.

Prepare for your date night as if you were really trying to make a good first

impression.

Anything you do that is spontaneous may not work out as well as if you had

planned out every last detail

-Attributive clauses:

Begin by having a wonderful candlelight dinner in the restaurant and then

proceed to the room that you have reserved.

ask questions about where they are going and take note, without their
knowledge, of the mileage on the odometer before they leave and after they

return.

-Clauses of time:

and take note, without their knowledge, of the mileage on the odometer before

they leave and after they return.

While none of these reasons may be justified, they do exist.

12.25. Semi-clauses

12.25.1. Infinitive

The infinitive comes in useful both in the function of a nominal clause element (subject and object) and in the function of an adverb and attribute.

- function of the subject

The purpose of this report is to provide introductory information

The purpose of this report is to present the basic design

- **function of the object**

...steam is allowed to form directly in the core..

- **function of the attribute**

...the design to be used by the consortium operate...

However, there is evidence to show that complete

- **function of the adverb:** is the most common in the TR

...and then it proceeds to turn a turbo generator.

Safety system is designed to prevent meltdown

systems are designed to deal with loss-of-coolant accidents.

The pellets are dished at the ends to allow for thermal expansion

NET:

- **function of the part of the predicate**

If they seem to have trouble explaining where they have been

- **function of complementation of the adjective**

will be happy to be sharing a sense...

- **function of the subject**

Still another way to spice up a waning relationship is to sign up...

- **function of the object**

...is starting to waiver...

Don't be afraid to suggest

This new interaction will help to pull you out of a rut.

- **function of the adverb**

and may not strive to keep the element of excitement

Don't just schedule a night to go out to dinner

- **function of the attribute**

Still another way to spice up a waning relationship is to sign up

Spending a night at a hotel is another way to restore

it's time to shake things up a bit.

...make plans to go hiking every Saturday morning

...that you have a reason to be suspicious

222.5.2. Gerund

A gerund is a kind of verbal noun that exists in some languages. In today's English, it ~~can~~ behave as a verb within a clause (so that, for example, it may be modified by an adverb or ~~have~~ an object), but the clause as a whole (sometimes consisting only of one word, the gerund) acts as a noun within the larger sentence.

TR.:

- *In keeping with our January 22 agreement* → **substantive,**
- *I am submitting the accompanying technical background report,*

The city council is currently investigating → **verb, present continuous**

- *while the pressurizer maintains the operating pressure* → **adjective, part of an object**
- *system that consists of two loops containing pumps, the reactor cooling water entering the core is highly pressurized, The core is the active*

portion of the reactor providing heat to the system.,. to form an egg-
crate arrangement providing rigid support, primarily those involving
coal, → **present participle, substitutes a dependent clause**

- where additional drying is done , reducing the time between initial
plans for and operation of nuclear power plants will cut these costs ,
There are two types of light water reactors: the pressurized water
reactor and the boiling water reactor → **adjective, modification by
an adjective**
- reactor operates by having a central unit → **verb government**

NET:

- Most relationships are very exciting in the beginning..., → **adjective-
part of the predicate-linking verb, substantive-time adjunct**
- If you think your partner is cheating on you → **verb-present
continuous**
- The following(1) are a few tips for ensuring(2) that your relationship
stays as exciting(3) as it was in the beginning(4) →, **1. adjective-part
of a linking verb(inversion) 2. substantive-object, 3. adjective-verb
nominal predicate, 4. substantive-time adjunct**
- if you can do a little investigating on your own → **substantive-object**
- let your instincts take over for a minute instead of relying on
rationality→ **verb government, substitute a dependent clause**
- Exploring a new location together is another way to bring..., Having a
common interest can also promote excitement in a relationship.
→ **substantive-subject**
- you'll find your relationship taking a turn for the better..→ **present
participle**
- Still another way to spice up a waning relationship is...→ **modification
by an adjective**
- The simple act of holding hands can...→ **substantive-objective
genitive**
- Trying kissing them with passion the next time you see them..
→ **substantive, verb government**

2.2.3. Conclusion

Syntax of both texts differs considerably. Meanwhile in the technical report there is a higher usage of complex sentences which equate with the usage of simple sentences, in the non-economical text there occur mainly compound complex sentences and simple sentences appear rarely. "Ve vědeckém stylu převládají struktury knižního typu, složené bez elips. Jeden z nejobvyklejších způsobů, jak ukázat, že jeden jev závisí na druhém, je vztah podmínkový. (spojky *if, unless*)."⁴ According to my work this opinion would not be correct, because this statement is in force of the non-economic text. I came across many types of dependent clauses here, whose majority is formed by conditional clauses. On the other hand in the technical report there are a lot of attributive clauses.

What I consider as a main agreement in both texts is the length of sentences. The sentences are long, which affects the readability. "Readability research shows that long sentences make texts more difficult for readers to absorb. Almost all readers experience this, although they may not identify this cause. Many readers are so generous that they attribute their growing discomfort to lack of concentration or ability. Long sentences are difficult because of the way we read. After reading a paragraph of text, we do not remember every word, but retain ideas, facts and images."⁵ I think the difficulty of reading is not about the length of sentence but the usage of difficult terminology or unfamiliar word. That is why the non-economic text is more likely to be understood.

Although the compatibility is one of the main characteristics of technical style and is typical through the grammatically brief way of expression, which is formed by an infinitive and gerund constructions, I have to say, that this grammatical feature appears in the non-economic text commonly.

The difference is that in the non-economic text there are lots of gerund constructions. The gerund does not represent just participle, whose function is to make sentences shorter and to substitute a dependent clause (= complex interstitial condensation), but plays a big role in the realization of the subject and many other clause elements.

⁴D.Knittlová-Teorie překladu, str.88

⁵Christopher Turk-Effective writing, p.93

2.3. Lexicology

In this section I will be holding forth on the differences between the vocabulary of economic and non-economic texts and also I would like to touch the question of possibility of using the technical vocabulary in other fields and conversely.

Lexicology is a speciality in linguistics dealing with the study of the lexicon.

Each technical branch has its own terminology, as we can see in Technical Report. The term should meet the following conditions: Have a precise meaning, be unambiguous within its field, be stable, have no emotional connotation and be suitable for making derivatives and compounds from it. The terms often crate subsystems and sequences.⁶

2.3.1. Technical terminology:

pressurized water reactors, Core , Fuel, Fuel Rod, Fuel Assembly, Control Rods, Reactor Vessel, Steam Generators, Heat Exchangers, Steam Drum, Pressurizer, Production of Electricity, Circulating Water, Primary System , Secondary System, boiling water reactors, Core, Fuel , Fuel Rod , Fuel Assembly , Control Rods , Core Shroud and Reactor Vessel, Re-circulation System, Steam Separators, Steam Dryers, Circulating Water , Electricity, Residual Heat Removal System, Emergency Core Cooling System, Containment Building, Drywell, Emergency Core Cooling System, Nuclear Regulatory Commission's Role, Busbar Costs, Construction Costs , Operation and Maintenance Costs , Fuel Costs, Operating Capacity, Availability Factor, Capacity Factor

In The text I can see plenty of specialized terms – the jargon of the field the report is about. For specialist and expert audiences, this terminology probably won't be defined, the intended readers should already know it.

The economic text (Technical report) is typically full of technical terminology, but as I found out, there were also some technical words in non-economic text. They appear rarely, but it is possible to come across them. The reason why they are used in non-technical text is actually the explanation of the situation, which demands the technical terminology. However,

⁶ Tchrisopher Turk-Effective writing, p...

the usage is casual and we cannot count with it. The terms often become the words of usual language.

23.2. Terminology of non-economic text (NET)

Genetics, Hypothesis, Genetically, Procreation, Prehistoric times, Logistics, Adrenaline, Odometer, Internet, Investigator, Elaborate

It should be clear from these examples that some technical words are common in ordinary English.

Usual vocabulary of non-economical text.

Reason, men, relationship, challenge, lack of interest, justifiable, partner, true, excuse, today, loving, infidelity, affair, women, competition, friends, fear, these, esteem, to cheat, have, feel, find, is, are, to bring, to see, to prepare, to go, spend, make, phone number, important, to catch, knowledge, call, information, habit, couples, kissing, enjoy, explore, happy, message, noticing, completely, night, spontaneous, progresses, setting, cosy, romantic, better, time...

The majority of vocabulary belongs to the **neutral** vocabulary that also contrasts with informal. There are some words, which could never be used in Technical Reports, such as

Adjectives of high intensity:

exciting, dull, boring, romantic, happy, cosy, intimate

23.3. Functional connotations, linking devices: In both economic and non-economic text there I have found few prepositions, conjunctions, adverbs named functional connotations or linking devices:

NET: *Before, after, additionally, completely, however, lately, while, probably, especially, recently, likely, sooner than later, frequently.*

TR: *in addition, while, directly, slightly, after, approximately, basically, primarily, however, nearly.*

23.4. Compound nouns

TR:

Single word compounds:

- turbo - generator, shutdown

Two or more word compounds:

- *nuclear power plants, nuclear power, secondary system, steam drum, control rods, steam separator, steam dryer, fuel rod*
- *reactor coolant system, light water reactor, core monitoring instrument, boiling water instrument*
- *residual heat removal system, emergency core cooling system, loss-of-coolant accident,*
- *reactor core isolation cooling system*

NET:

Single word compounds:

- *relationship, unbeknownst, mileage, odometer, internet, somewhere, candlelight, contradicting, elsewhere, unhappy, meaningful, everywhere, reconnect, hypothesis, procreation, overpopulation*

Two or more word compounds:

- *credit card, flower shop, phone number, phone statement, investigating tools, self esteem, Saturday morning, an elaborate trip, exotic location, setting up, prehistoric times*
- *credit card bill, truly loving relationship*

The usage of compound word is frequent in both texts. The main difference is, that in Technical Report there are a lot more word compounds. I have even found four – and five word compounds, which did not appeared in non-economic text.

That is why I can say that the long words represent a common feature of technical writing. „Long words affect readability.⁷ Simple writing is more readable. Long words often confuse readers. Many writers of reports in industry use long words for two reasons: to confuse and to impress. Long, unfamiliar words are often highly abstract, and fail to communicate because they embrace too many different meanings. Readers are not able to decode clear ideas or images, they are left confused, unable to settle on a specific picture of the action involved.“

That is why the Technical report is aimed at a specific audience. It is designed or adapted for specific audiences-in this case, those who are experts. The technical report must be written with that audience's needs and background firmly in mind.

⁷ Turk, Christopher, Effective writing, p. 98

2.3.5. Phrasal Verbs

The majority of phrasal verbs I have found in the non-economic texts:

settle into, rely on, pick up, bring back, spice up, sign up for, pull out, shake up, set up, ask about, pick up on...

Another way to bring the excitement back into your relationship is to set up a date night.

2.3.6. Numbers, abbreviations, formulas, and symbols.

Because technical subject matter so often involves such details as dimensions, statistics, and frequencies, it's common to see technical reports laden with specific numerical values, symbols special to the field, which we do not find in NET.

example:

Energy Research Consultants, Inc.

Encl. Technical background report on light water reactors.

These plants can produce as much as 370, 000 megawatts.

...diameter of 0.39 in...

This tube is 13 ft long...

...power plant are 18, 7 mills per kilowatt hour, ...

...amount to only 15% of the total cost...

2.3.7. Analysis of vocabulary

While there is considerable research evidence about the nature and coverage of high frequency and academic words, there has been little investigation of technical vocabulary and low frequency words. One of the reasons for this is that there has been little agreement about what technical vocabulary is and about how to count it reliably. In this article I describe technical vocabulary in Technical report and in an applied linguistics text. It provides at least initial answers to the questions:

How big is a technical vocabulary?

What kinds of words make up a technical vocabulary?

How important is technical vocabulary in specialised texts?

Words were classified as being technical or non-technical words by rating them on a four point scale designed to measure the strength of the relationship of a word to a particular specialised field. The scale used to do this is in the table, which has the scale for the machine vocabulary. The applied linguistics scale was essentially the same with different examples and suggested areas. Items classified in steps 3 and 4 are considered to be technical words. Items in steps 1 and 2 are not.

A rating scale for finding technical words

Step 1

Words such as function words that have a meaning that has no particular relationship with the topic of technical report, that is, words independent of the subject matter.

Examples are: the, is, in, it, by, 22, call, city, number, respect, approximately, early, and especially.

Step 2

Words that have a meaning that is minimally related to the field of machinery in that they describe the positions, movements, or features of the machine.

Examples are: secondary, part, forms, pairs, structures, consists, operate, associated, key costs, expansion.

Step 3

Words that have a meaning that is closely related to the field of technology. They refer to parts, structures or functions of the machine, such as the regions of the reactor and systems of it. Such words are also used in general language. The words may have some restrictions of usage depending on the subject field.

Examples are: core, fuel, rod, reactor, vessel, generators, system, electricity, steam, dryer, costs, construction, factor, pump. Words in this category may be technical terms in a specific field like machinery and yet may occur with the same meaning in other fields and not be technical terms in those fields. *Example: steam generator X steam above the kettle*

Step 4

Words that have a meaning specific to the field of machinery and are not likely to be known in general language. They refer to structures and functions of the machine. These words have clear restrictions of usage depending on the subject field.

Examples are: reactor vessel, steam drum, core cooling system, boiling water reactor, turbine, condenser, feed-water

23.8. Conclusion

The result of the analysis corresponds to the statement of lexicology in the theoretical part. The technical report does consist of technical professional terminology, which differs from the vocabulary of non-economical text. Because the technical report describes the function of nuclear reactor, we come across the technical terminology of machinery very often. The usage of terminology is very high in the comparison with the other text.

According to my analysis the terminology can appear also in non-economic text, where I have found a few special terms as well.

What I consider interesting is usage of particular terms in other fields. „Termíny se vyznačují tím, že nejsou emocionální, jsou jednoznačné, mají úzký význam a omezené pole použití.“⁸ Here I would discuss the last statement. According to my 4 scaled table of vocabulary I am inclined to the opinion that many terms can appear in other fields, as it is to see in the scale 3. Of course it cannot be said about the specified terminology, which is mentioned in the scale 4.

Otherwise there are lots of differences in both texts.

In the technical report there we can find numbers, abbreviations, formulas, and symbols, meanwhile in non-economic text there are hardly any.

On the other hand phrasal verbs are usual just for non-economic text.

The compatibility of expression is represented by the usage of noun-groups, which is especially to see in the technical report. In both texts I have found lots of compound words, but in the case of technical report the usage is much higher, especially the usage of more word compounds.

„S objektivizací odborného vyjadřování souvisí i specifický způsob využití jazykových prostředků nazývaný *intelektualizace nebo racionalizace*.“⁹ It means the particular and exact expression. Emotionality and expressiveness is repressed, which hardly ever brings the emotional word, interjection and expressive phraseology that often appear in non – economic text.

⁸ D.Knittlová-teorie překladu, p.91).

⁹ D.Knittlová, teorie překladu, p. 91

2.4. Stylistics

In this part I will be comparing the style of technical report and non-economic text. At the first sight it is clear that there are lot of differences in the way of technical and non-technical writing. The Technical Report, that I analyse, has its own structure. It depends on the type of report - for example, technical background report, feasibility report, instructions, or some other, but not just reports, generally economical texts have their own structure that differs. There are lots of types of economic texts (ref.§1.5.) and for each of them there are strict rules how to write them.

2.4.1. Style of technical background report - Component by Component

According to my example of technical background report you can see what this technical report is supposed to look like.

Technical report in my work is divided into several parts. In this section I will examine each component of the formal report and point out the key specification in terms of content, design, and format.

Overview of the report. This report provides technical detail on two types of nuclear power plants.

Example:

The purpose of this report is to provide ...The report concludes with a review of the economic aspects of nuclear power plants.

Transmittal letter. The transmittal letter (or memo) is typically attached to the front cover of the report. If the front cover has an inside pocket, the transmittal letter can be placed there. The letter can refer to some prior agreement, provide a descriptive overview of the contents of the report (almost identical to the descriptive abstract on the title page), and encourage the recipients to get in touch if necessary. For convenience's sake, technical-writing instructors request that the transmittal letter be made the first (but unofficial) page of the report.

Technical Research Associates, Inc.
100 North Burnet Rd. Suite 300
Austin, TX 78759

July 6, 1996

Dr. David A. McMurrey, Director
Center for Technological Research
192 Rockdale Avenue, Suite 300
Austin, Texas 78712

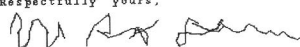
Dear Dr. McMurrey:

In keeping with our January 22 agreement, I am submitting the accompanying background report entitled Report on Light Water Nuclear Reactors.

The purpose of this report is to provide introductory information to city council members who are considering membership in a regional consortium. This report provides an explanation of how each type of light water reactor operates. In addition, the report discusses some of the basic safety mechanisms used in this type of reactor. The report concludes with a review of the economic aspects of nuclear power plants.

I hope this report will prove to be satisfactory.

Respectfully yours,


Joan A. Student, Vice-President
Technical Research Associates, Inc.

Encl.: Technical background report on light water reactors

Title page. The title page is the first official page in the report—it's the first page you see when you open the report. However, sometimes the transmittal letter is placed inside the report, as the first page, to keep it from getting lost or damaged.

Report
on
LIGHT WATER NUCLEAR REACTORS

submitted to
Dr. David A. McMurrey
Center for Technological Research
Austin, Texas
April 27, 1996

by
Joan A. Student
Technical Research Associates, Inc.

This report examines light water reactors as a possible alternative source of energy for municipalities. Both types of light water reactors are described, and an explanation of how each reactor produces electricity is presented. Safety systems and economic aspects conclude the main discussion of the report.

Notice that the title page contains the descriptive abstract, which is an almost word-for word copy of the summary of contents in the transmittal letter. Reports typically contain a lot of this sort of repetition to ensure that readers see the main points, however they read the report.

Table of contents. After the title page, the next page in the report is the table of contents (TOC). Notice the contents of this TOC: it lists the first-, second-, and third-level headings that occur in the report, along with the abstract and the information sources. Notice the format: the first-level headings are in all caps; the second- and third-level headings use

headline-style caps; notice also how they indented in relation to each other. And finally notice the leader dots that guide the eye out to the page number—the page on which the section starts.

TABLE OF CONTENTS	
LIST OF FIGURES	iv
ABSTRACT	v
I. INTRODUCTION	1
II. PRESSURIZED WATER REACTORS (PWR)	3
Description of Major Parts	3
Core	3
Control Rods	4
Reactor Vessel	5
Steam Generators	6
Pressurizer	7
Production of Electricity	8
Circulating Water to Primary System	8
Producing Steam in Secondary System	8
Separating the Steam	8
Producing the Electricity	9
III. BOILING WATER REACTORS (BWR)	10
Description of Major Parts	10
Core	10
Control Rods	11
Core Shroud and Reactor Vessel	12
Recirculation System	13
Steam Separators and Dryers	13
Production of Electricity	15
Circulating Water	15
Separating Steam	15
Drying the Steam	15
Producing the Electricity	15
IV. SAFETY MEASURES	17
Measures Used in the PWR	18
Residual Heat-Removal System	18
Emergency Core-Cooling System	18
Containment Building	20
Measures Used in the BWR	20
Drywell	21
Emergency Core-Cooling System	21
Nuclear Regulatory Commission's Rule	22

List of figures and tables. After the TOC comes the list of figures—and, in this report, the list of tables. This can include tables and any other sort of non-textual material. The standard design is to centre the words LIST OF FIGURES (in all caps) at the top of the page. The actual list uses two column headings—Figure and Page—initial cap and centred over their respective columns. In the figure list, you needn't include the entire figure title, just enough that is grammatically complete.

LIST OF FIGURES	
Figure	Page
1. Schematic of a Pressurized Water Reactor	3
2. Pressurized Water Reactor Core	4
3. Control Rod of a Pressurized Water Reactor	5
4. Heat Exchangers	6
5. Pressurizer	7
6. Schematic of a Boiling Water Reactor	10
7. Control Rod	12
8. Recirculation System	13
9. Steam Separators	14
10. Steam Dryer	14
11. PWR Emergency Core Cooling System	19
12. BWR Emergency Core Cooling System	21
13. Table of Nuclear Costs	24
14. Table of Economic Data from other Consortia	25

Abstract (informative). The next page (or pages) in the report is the informative abstract, also called the "executive summary." Note very carefully the difference between the descriptive and informative abstracts. This informative abstract summarizes the key facts and conclusions contained in the report. The descriptive abstract, on the other hand, just gives a teaser as to the report's purpose and topics covered.

ABSTRACT

Light water reactors are a category of nuclear power reactor in which water is used as both a coolant and a moderator. There are two types of light water reactors: the pressurized water reactor and the boiling water reactor. In a pressurized water reactor, steam is produced in a secondary system. The main components of a pressurized water reactor are the core, control rods, reactor vessel, steam generators, and pressurizer. The core contains fuel assemblies that contain fuel rods filled with fuel pellets. The coolant flows through the core where it is heated at high pressure. Then coolant then flows to a series of steam generators where the coolant flows through the heat exchangers and the steam drum. The pressure is lowered and steam is allowed to form which then flows to a turbine generator where electricity is produced. The control rods control the amount of nuclear fission reactions in the core while the pressurizer maintains the operating pressure in the reactor coolant system. The reactor vessel contains the fuel elements, the control elements, and the core monitoring instruments.

In a boiling water reactor, steam is allowed to form directly in the core. The main components of a boiling water reactor are the core control rods, the core shroud and reactor vessel, the recirculation system, the steam separators, and the steam dryers. The core of a boiling water reactor is slightly larger than that of a pressurized water reactor but contains the same elements. The coolant is circulated through the system by the recirculation the reactor vessel and jet pumps inside the

v

Introduction. The introduction is the first main body section of the report. Notice the format just about the "INTRODUCTION" heading. You see the full title of the report-just as it appears on the title page. Notice the contents of the introduction. It begins with some background on the topic-nuclear power plants. The second paragraph narrows in on the purpose of this report, while the final paragraph provides a quick overview of its contents.

First-level headings. As the online textbook chapter on headings emphasizes, first-level headings are used only in longer, more complex documents such as this one. Notice the format of the first-level heading: it's bold, all-caps, and centred. Notice too that first-level headings always begin a new page-indicated here by horizontal line across the page

example: I. INTRODUCTION

Second-level headings. If you think of the first-level heading as the roman-numeral parts of an outline, the second-level headings are like the capital-letter items, one level lower in the outline. Notice that they use headline-style caps: that is, the initial letter of all main words (except for prepositions and words like a, an, and the).

example: Description of the Major Parts

Third-level headings. If you think of second-level headings as the capital-letter items in a traditional outline, third-level headings are like the Arabic-numeral items in the outline, one level lower. Notice their format: they use sentence-style caps, that is, first letter of the first word is capitalized only. Also notice that they are bold and are punctuated with a period, and

finally notice that they "run in" to the paragraph-but are not a grammatical part of that paragraph.

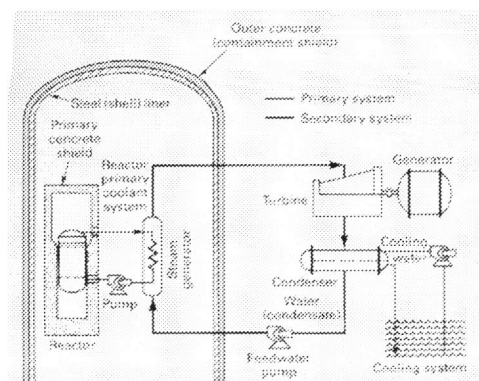
Example:

Core. The core is the active portion of the reactor providing heat to the system. The core contains fuel assemblies that contain fuel rods filled with fuel pellets.

Fuel. The fuel in the pressurized water reactor consists of cylindrical pellets of slightly enriched uranium dioxide with a diameter of 0.325 in by 0.39 in. The pellets are dished at the ends to allow for thermal expansion [12:2004].

Page numbering. Numbering pages in a report may seem strange, but it is the traditional way. Notice that all pages before page 1 of the introduction use lowercase roman numerals. All pages beginning with page 1 of the introduction use Arabic numerals. Although styles vary, this report put all page numbers at the bottom of the page in the centre. Notice that page numbers are not shown on some pages, such as the title page, first page of the introduction.

Illustrations and tables. Note that illustrations are placed at the points where they are referenced in the report-not all at the end. Notice the format of the figure titles. The figure number is followed by a brief descriptive title and, if the figure is borrowed, some information about the source of the figure.



Graphics: The report should have graphics as this report for example. "Způsob grafického uspořádání textu a míra jeho zvýraznění jsou významnými prostředky, které přispívají k vyjádření specifických významů a významových odstínů v psaném textu. Typy písma, jeho velikost a rozvržení textu (angl. Graphetics and lay-out) hrají důležitou úlohu z hlediska upoutání čtenářovy pozornosti (angl. eye-catching effects). Stejně tak působí na čtenáře obrazový materiál a jiné vizuální prostředky, jako například mapy, grafy, barva a členění plochy (angl. visuals). Tyto vlastnosti jsou důležité pro přehlednost (angl. Surveyability) a uchovatelnost (angl. Preservability) textu."¹⁰

¹⁰ Úvod do anglické stylistiky-Ludmila Urbanová, Andrew Oakland, p.32

Source citations. Notice the bracketed numbers occurring throughout the report. These indicate the source of borrowed information, at each point where it is borrowed. Go to the end of the report to see what the various sources are. For example, the citation [1:7-11] means that the information in that section of the report came from pages 7 through 11 of source 1.

Information sources. The report should make use of information sources. These may include not only books and articles that can be found in libraries but also technical brochures, interviews or correspondence with experts, as well as first-hand inspections.

At the end of the report there is the list of information sources. This report uses the number system in which the sources are numbered. These numbers are used along with page references in the body of the report to indicate the source of borrowed information. Notice several things about this list: the items are in alphabetical order with last name first; first main word of the title is used in no author name is available; book and magazine names are in italics; article titles use quotation marks.

Bupp, Irwin C., Jr., and Robert Trietel. 1976. The Economics of Nuclear Power. Boston: MIT.

Burn, Duncan. 1978. Nuclear Power and the Energy Crisis. New York: New York University Press.

2.4.2. Style of non- economic text

The text I have chosen belongs to the style of persuasive writing (which is also style of journalism, factual communication). Persuasive writing, also known as the argument essay, utilizes logic and reason to show that one idea is more legitimate than another idea. It attempts to persuade a reader to adopt a certain point of view or to take a particular action. The argument must always use sound reasoning and solid evidence by stating facts, giving logical reasons, using examples, and quoting experts.

The goal is the education and the information. We come across to topical problems and veracity of the content. The form and the contents are accessible and comprehensible. It is possible to come across to both formal and informal factors.. The text, as well as TR, has its format. It consists of introduction, body and conclusion.

The introduction starts with a general discussion of the subject and lead to a very specific statement of the main point. Sometimes an essay begins with a "grabber," such as a challenging claim, or surprising story to catch a reader's attention. The thesis should tell in one (or at most two) sentence(s), what the overall point or argument is, and briefly, what the main body paragraphs will be about.

Example: Most relationships are very exciting in the beginning.... few tips for ensuring that your relationship stays as exciting as it was in the beginning.

The introduction should be designed to attract the reader's attention and give him/her an idea of the essay's focus.

The body paragraphs will explain the essay's topic. Each of the main ideas will become a paragraph in the essay. The topic must now be explained, described, or argued.

Each body paragraph has the same basic structure.

Each main body paragraph will focus on a single idea, reason, or example that supports the thesis. Each paragraph will have a clear topic sentence (a mini thesis that states the main idea of the paragraph).

Body Paragraph often begins with a transition word or words like, Firstly, "Next" or "Second" or "Another reason" or "The second of these reasons" , Finally, and gives examples and/or details relating to the supporting reason.

Example:

Another deceptive way to catch a cheating partner is...

The conclusion serves to give the reader closure, summing up the essay's points or providing a final viewpoint about the topic.

The conclusion consists of three or four convincing sentences. The main points are clearly reviewed, or the opinion about the topic is briefly described.

Example:

Over time a relationship may lose some of the excitement that it had in the very beginning... few simple actions you can be on your way to an exciting relationship.

2.4.3. Conclusion

The difference in the style of both texts is clear to recognize at the first sight without analysing it. Then during the analysis we come across the facts that are more concrete. The part of stylistics represents actually the only part, where the difference is absolute.

Texts have their own structure that must be completed – there is no doubt about it and the texts have it in common. If I had analysed technical style in general, I would have found out totally different features. Each writing differs, has different structure and style. As I have already mentioned there are also many types of reports (ref.:§ 1.5.) and each of them has its own format. Here are some differences and findings:

TR:

Factual detail: The report should be very detailed and factual. The point of the report is to go into details, the kind of details your specific audience needs.

Documentation: Borrowed information in the technical report must be cited in the part of sources. The style of citing the sources is also called "documenting" the sources. One style commonly used in science and engineering is called the number system.

Realistic audience and situation: The report must be defined for a real or realistic group of readers who exist in a real or realistic situation. Most students invent an audience and situation. And the audience can't merely be something like "anybody who might be interested in global warming." Instead, it has to be real, realistic, and specific: for example, "Texas Coastal Real Estate Developers Association, interested in reliable information on global warming, to be used to aid in long-range investment planning.

Headings and lists: Headings break text into manageable sections, and help by increasing the „white space“ around the blocks of type, especially when the type is single spaced. They also act as signposts, pointing out what is to be found in each section.

Special format: The technical report uses a rather involved format including covers, binding, title page, table of contents, list of figures, transmittal letter, and appendixes. These have to be prepared according to a set standard, which will be presented in a later chapter.

Length: The report should be at least 8 double-spaced typed or printed pages (using 1-inch margins), counting from introduction to conclusion. This is a minimum; a report of this length is rather skimpy. There is no real maximum length, other than what your time, energy, and stamina can handle. But remember that sheer weight does not equal quality.

NET:

Factual detail: The text is not so detailed as TR but it is factual. The point of the text is to go into general information. The information, that is offered, does work for its specific audience.

Realistic audience and situation: The text must be defined for a real or realistic group of readers who exist in a real or realistic situation. It is the same rule like in TR.

Headings and lists:

It is used without numbering, with capitals and lower case letters.

First level heading

It is used only in the beginning of the whole text .

Relationship articles

Second level heading

example:

10 Tips For More Exciting Relationship

How To Catch A Cheating Partner

Special format: In the case of my NET there are no specialities like in TR, such as binding, title page, table of contents, list of figures, transmittal letter, and appendixes. It is just divided into articles and each article into paragraphs.

Length: I have to take into consideration, that the text is just an extract, so I cannot compare the length. Generally it depends on the topic and it's working out. The length is not strictly limited.

Conclusion

My thesis has helped me to understand the style of technical writing and has given me a lot of new information. I could see how many differences there are between the economic and non-economic text, which hopefully I will utilize in my future work.

On the other hand technical writing is nothing easy. Many companies hire technical writers to document policies and procedures for auditors. This means I would actually sit with someone and write down the steps they follow to do a function. Technical writers must be excellent communicators. Verbal and written skills must be of the highest calibre. A technical writer must be methodical, organized, and succinct.

Technical writers put technical information into easily understandable language. They prepare operating and maintenance manuals, catalogues, parts lists, assembly instructions, sales promotion materials, and project proposals. Many technical writers work with engineers on technical subject matters to prepare written interpretations of engineering and design specifications and other information for a general readership. Technical writers also may serve as part of a team conducting usability studies to help improve the design of a product that still is in the prototype stage. They plan and edit technical materials and oversee the preparation of illustrations, photographs, diagrams, and charts. The comparison of economic and non-economic text in my thesis has showed me that I have to follow many rules and not all language features that we usually use in every day speech can be used while writing a technical text. According to my thesis I can recognize grammatical, syntactic, lexical and stylistic problems that may occur whilst writing.

I have decided to analyse a technical report, because major focus of many technical writing is the technical report. Just about everything I study, everything I write, is geared towards writing this final thesis that also carries the features of report.

For many students, the technical report is the longest document they have ever written. It normally involves some research; often the information comes not only from published sources in the library, but also sources outside the library, including non-published things such as interviews, correspondence, and videotapes. It may also be the fanciest document: it uses binding and covers and has special elements such as a table of contents, title page, and graphics.

To sum up, the analysis represents the first step in practising and improving my skills.

České résumé

V mé bakalářské práci analyzuji odlišnosti dvou rozdílných textů, přičemž jeden z vybraných textů je odborný, z oblasti ekonomie. Zaměřuji se na několik jazykových rovin, morfologickou, syntaktickou, lexikální a stylistickou. Problematika odborného textu je velice rozmanitá. Protože existuje celá řada různých typů, je na místě podotknout, že z výsledku mé srovnávací analýzy nelze vyvozovat trvale platné pravidlo pro odborné psaní a používat jej pro ostatní typy. Jedná se o konkrétní analýzu dvou textů, ne stylů. Pro mou práci jsem vybrala odbornou zprávu (Technical Report), kterou srovnávám s odlehčenými články, pojednáním o partnerských vztazích, které zahrnuji do žurnalistického stylu. Je tedy jasné, že pokud bych zvolila jiný text, ač odborný ekonomický, výsledek by byl zcela odlišný. Velmi záleží na výběru, který v mém případě byl cílený, vzhledem k tomu, že bych se jednou ráda věnovala překladům ekonomických textů a zpráv, kde znalost jejich forem a ustálených pravidel je nutná.

Samozřejmě styl jako takový má svá pravidla a všechny jazykové roviny se jimi řídí, jak uvádím v teoretické části bakalářské práce. Praktická část by měla tato pravidla potvrzovat nebo naopak vyvracet. Dovídáme se zde, zda odborná zpráva opravdu nese veškeré prvky, které jsou pro styl vědy a techniky charakteristické, zda tyto prvky jsou limitované a mohou se objevit i v textu jiného stylu jako je například mnou vybraný neekonomický text.

Podle lipských lingvistů odborné jazyky teoretických a aplikovaných věd a jazyky technických a výrobních oborů představují velmi diferencované, mnohotvárné útvary. Technický jazyk se v posledních desetiletích v důsledku specializace rozštěpil ještě více než třeba právnický, lékařský atd. Např. jazyk v provozech výpočetních středisek, u jaderného reaktoru, v továrně na obráběcí stroje a v závodě zpracovávajícím plastické hmoty se liší pokaždé jinak, ale přinejmenším stejně výrazně jako jazyky vědecké od jazyků prodavačských v podnicích téhož oboru. Každý obor má dnes vlastní odborné názvosloví, ale rozdíly jsou i ve skladbě. Důsledným užíváním vědecké terminologie a propracovanou větnou skladbou se dosahuje stále přesnějšího vyjadřování. A sdělovat myšlenky různých oborů přesně, výstižně a úplně je hlavní funkcí vědeckého stylu. Vědecký styl se realizuje nejčastěji formou písemnou podobně jako styl administrativní, je však prvořadě monologický.

Jak již bylo řečeno, praktická část je rozdělena na čtyři srovnávací celky.

V první části-morfologické zjišťuji, čím se od sebe liší jednotlivé gramatické formule obou textů. Uvedla jsem takové jevy, které se objevují v textech nejčastěji, což v tomto případě je použití slovesného rodu a časů. Nejmarkantnějším gramatickým rozdílem je trpný rod. Odborný text v porovnání s textem ne odborným je ve velké míře psán v trpném rodě. Tímto jsem potvrdila předzvěst z teoretické části. Pasivum totiž slouží k neosobnímu vyjadřování, které má ve vědeckém stylu nejbohatší uplatnění. Setkávám se hlavně s větami typu: „...it is separated from the coolant.“ Na druhou stranu neosobost lze také vyjádřit pomocí modálních sloves. Ta se však kontrastně nachází hlavně v textu neekonomickém, ovšem v činném rodě: „A massage can be a very sensual and intimate experience.“ Co se týká časů, v praktické části jsem již nastínila, že odborná zpráva popisuje a vysvětluje čtenáři funkci stroje, zde jaderného reaktoru, tudíž rozmanitost časů není na místě a setkáváme se zde převážně s časem přítomným prostým. Naopak neekonomický text jakožto přesvědčovací pojednání dává čtenářům instrukce a popisuje různé situace, proto je četnost různých časů

(přítomný prostý, přítomný průběhový, předpřítomný, předminulý...) tak vysoká. Slovesný způsob přinesl rozdíl hlavně v rozkazu. Ačkoliv rozkazovací způsob je pro styl techniky charakteristický (např. typu „Open vent C to blow off steam.“), objevuje se pouze v textu neekonomickém: „Review the credit card bill each month“. Oba texty se shodují v používání přivlastňovacího pádu pomocí „of“, což má za následek hutnost projevu. Vytváří se tak nominální vazby a rozvité determinační skupiny-tzv. sémantické kondenzátory, viz.

§ 2.1.7. Ačkoliv vysoké používání tohoto jevu je běžnější v odborném stylu, v mém vybraném neekonomickém textu se kupodivu také hojně vyskytuje.

Lexikální část ukazuje, jak se od sebe liší slovní zásoba. Co se týká odborného textu, výsledek splňuje teoretickou část, ve které kladu důraz na odbornou terminologii. Termíny se zde vyskytují hojně, viz. § 2.3.1. Typickým slovním druhem jsou substantiva, popřípadě adjektiva, a převahu mají odborné výrazy, které se pečlivě volí, aby byly jednoznačné. Výrazů subjektivních a expresivních se oproti neekonomickému textu nepoužívá. Naopak i v ne odborném textu, jak ukazuje analýza, se mohou běžně odborné termíny vyskytnout. Charakteristickým znakem obou textů jsou složeniny, hlavně víceslovní, i když v odborném textu se jich objevuje mnohem více. Překvapivým úkazem jsou tzv. funkční výrazy, které jsou pro odborné texty charakteristické, říká se jim i navazující formule. Patří sem příslovečná, předložková a spojková spojení. Těchto výrazů se však mnohem více objevuje v textu neekonomickém: *before, after, additionally, completely, however, lately, while, probably, especially...*

V syntaktické části analyzuji a porovnávám typy vět. Nejmarkantnějším skladebním rysem vědeckého stylu je přesná formulace a logický sled vět, mezi nimiž je jasný vzájemný vztah a závislost. S přísnou logickou návazností vět souvisí také uspořádání větných členů, případně vět uvnitř souvětí. Oba texty jsou bohaté na polovětné konstrukce, jež často mají funkci různých větných členů. Tomuto tématu se věnuji v odstavci 2.2.2.5.2, kde hlavně v neekonomickém textu je k vidění mnoho různých větných členů vyjádřené *gerundiem*.

Odborný text je v porovnání s neodborným bohatý jak na souvětí podřadná, tak i věty jednoduché. Nejčastějším typem vedlejších vět je *věta přívlastková* po spojce *that*. V textu neodborném převládají hlavně složitá souvětí souřadná. Často se vyskytují vedlejší věty *podmínkové* po spojce *if*.

Nejvíce rozdílů nalézám ve stylistické části. Způsob grafického uspořádání textu a míra jeho zvýraznění jsou významnými prostředky, které přispívají k vyjádření specifických významů a významových odstínů v psaném textu. Pokud se čtenář podívá na oba texty, již pouhým okem rozpozná, že každý text má svou strukturu, členění i vizuální materiál. Co se stylu týče, texty jsou naprosto odlišné.

Díky této analýze jsem se mohla přesvědčit o tom, že ačkoliv dva texty odlišných stylů mají svá vytýčená pravidla, ne vždycky jsou dodržována. Prvky, které se přiřazují pouze odbornému stylu se objevily i v textu neodborném a naopak.

Information sources

- TURK, CHRISTPOHER AND KIRKMAN JOHN: Effective writing, 1989, reprinted 1992
- URBNOVÁ, LUDMILA, OAKLAND ANDREW: Úvod do anglické stylistiky, 2002
- PEPRNÍK, JAROSLAV: English lexicology, 2001
- DUŠKOVÁ, LIBUŠE a kol.: Mluvnice současné angličtiny na pozadí češtiny, Academia Praha 1994
- DUŠKOVÁ, LIBUŠE: Syntax současné angličtiny, 2002
- KNITTLOVÁ, D: Teorie překladu, Olomouc 1995
- JANATA, P.: Překládáme do angličtiny, Fraus 1999
- KUFNEROVÁ, Z., SKOUMALOVÁ, Z.: Překládání a čeština, Jinočany 1994
- Advanced Learners Dictionary, Oxford 1995
- CRYSTAL, DAVY: Investigating English style, Oxford 1991
- English style guide-A handbook for authors and translators in the European Commission, fifth edition 2005
- McMurre, A. David : Power Tools for Technical Communication
- www.io.com
- www.wikipedia.org
- www.seznam.cz
- www.yahoo.com
- <http://owl.english.purdue.edu/internet/resources/genre.html>
- <http://volweb.utk.edu/Schools/bedford/harrisms/studentpage.htm>

Supplement

1. Technical Report

1092 Willowcreek Dr.
Austin, Texas 78741
April 27, 19XX

Mr. David A. David McMurrey
Energy Research Consultants, Inc.
1307 Marshall Lane, Suite 3200
Austin, Texas 78712

Dear Mr. McMurrey:

In keeping with our January 22 agreement, I am submitting the accompanying technical background report entitled *Light Water Nuclear Reactors*.

The purpose of this report is to provide introductory information to city council members who are considering membership in a regional consortium. This report provides an explanation of how each type of light water reactor operates. In addition, the report discusses some of the basic safety mechanisms used in this type of reactor. The report concludes with a review of the economic aspects of nuclear power plants.

I hope this report will prove to be satisfactory.

Respectfully yours,

Jeffrey D. Lacruz

Encl. Technical background report on light water reactors

Report on
LIGHT WATER NUCLEAR REACTORS

submitted to

Mr. David A. McMurrey
Energy Research Consultants, Inc.
Austin, Texas

April 27, 19XX

by
Jeffrey D. Lacruz

This report examines light water reactors as a possible alternative source of energy for Luckenbach, Texas. Both types of light water reactors are described, and an explanation of how each reactor produces electricity is presented. Safety systems and economic aspects conclude the main discussion of the report.

TABLE OF CONTENTS

LIST OF FIGURES	v
LIST OF CHARTS	v
ABSTRACT	vi
 I. INTRODUCTION	 1
II. PRESSURIZED WATER REACTORS (PWR)	3
Description of Major Parts	3
Core	3
Fuel	3
Fuel Rod	4
Fuel Assembly	4
Control Rods	4
Reactor Vessel	5
Steam Generators	6
Heat Exchangers	6
Steam Drum	6
Pressurizer	7
Production of Electricity	8
Circulating Water to Primary System	8
Producing Steam in Secondary System	8
Separating the Steam	8
Producing the Electricity	9
III. BOILING WATER REACTORS (BWR)	10
Description of Major Parts	10
Core	10
Fuel	11
Fuel Rod	11
Fuel Assembly	11
Control Rods	11
Core Shroud and Reactor Vessel	12
Recirculation System	13
Steam Separators	13
Steam Dryers	14
Production of Electricity	15
Circulating Water	15
Separating Steam	15
Drying the Steam	15
Producing Electricity	16
IV. SAFETY MEASURES	17
Measures Used in the PWR	18
Residual Heat Removal System	18
Emergency Core Cooling System	18
Containment Building	20
Measures Used in the BWR	20
Drywell	21
Emergency Core Cooling System	21
Nuclear Regulatory Commission's Role	22
V. ECONOMIC ASPECTS	24
Busbar Costs	24
Construction Costs	24
Operation and Maintenance Costs	25

Fuel Costs	25
Operating Capacity	26
Availability Factor	26
Capacity Factor	26
VI. CONCLUSION	28
APPENDIX	29
Information Sources	30

LIST OF ILLUSTRATIONS

Figure	Page
1. Schematic of a Pressurized Water	3
2. Pressurized Water Reactor Core	4
3. Control Rod of a Pressurized Water Reactor	5
4. Heat Exchangers	6
5. Pressurizer	7
6. Schematic of a Boiling Water Reactor	10
7. Control Rod	12
8. Recirculation System	13
9. Steam Separators	14
10. Steam Dryer	14
11. PWR Emergency Core Cooling System	19
12. BWR Emergency Core Cooling System	21

LIST OF TABLES

1. Busbar Costs	24
2. Economic Data from Other Consortia	25

ABSTRACT

Light water reactors are a category of nuclear power reactor in which water is used as both a coolant and a moderator. There are two types of light water reactors: the pressurized water reactor and the boiling water reactor. In a pressurized water reactor, steam is produced in a secondary system. The main components of a pressurized water reactor are the core, control rods, reactor vessel, steam generators, and pressurizer. The core contains fuel assemblies that contain fuel rods filled with fuel pellets. The coolant flows through the core where it is heated at high pressure. Then coolant then flows to a series of steam generators where the coolant flows through the heat exchangers and the steam drum. The pressure is lowered and steam is allowed to form which then flows to a turbogenerator where electricity is produced. The control rods control the amount of nuclear fission reactions in the core while the pressurizer maintains the operating pressure in the reactor coolant system. The reactor vessel contains the fuel elements, the control elements, and the core monitoring instruments.

In a boiling water reactor, steam is allowed to form directly in the core. The main components of a boiling water reactor are the core control rods, the core shroud and reactor vessel, the recirculation system, the steam separators, and the steam dryers. The core of a boiling water reactor is slightly larger than that of a pressurized water reactor but contains the same elements. The coolant is circulated through the system by the recirculation system that consists of two loops containing pumps external to the reactor vessel and jet pumps inside the vessel. After steam is formed in the reactor vessel, it flows to a series of steam separators where it is separated from the coolant. The steam then flows through steam dryers where additional drying is done, and then it proceeds to turn a turbogenerator. The control rods and reactor vessel function in the same way as in the pressurized water reactor.

Safety system is designed to prevent meltdown in both types of light water reactors. The safety systems in a pressurized water reactor include the residual heat removal system, the emergency core cooling

vi

systems, and the containment building. The residual heat removal system removes decay heat from the primary coolant system during plant shutdown. The emergency core cooling systems are designed to deal with loss-of-coolant accidents. The passive system consists of accumulators which inject coolant into the vessel when an accident occurs. The low pressure injection systems and the high pressure injection systems also provide make-up water. The safety systems of a boiling water reactor include the drywell and emergency core cooling systems. The reactor core isolation cooling system pumps water into the reactor during a loss-of-coolant accident while the low and high pressure core spray systems provide make-up water. The drywell encloses the reactor vessel, and the containment vessel encloses all the components of the reactor. The Nuclear Regulatory Commission inspects all nuclear power plants to ensure that these safety systems are adequate.

The economics of a nuclear power plant are determined by the busbar cost and the operating capacity costs. The busbar cost is determined by the construction cost, the cost of operating and maintaining the plant, and the cost of the fuel. The operating capacity costs are determined by the availability of fuel and the capacity of the plant.

vii

Report on
LIGHT WATER NUCLEAR REACTORS

I. INTRODUCTION

There are approximately five hundred nuclear power plants in operation or under construction worldwide. These plants can produce as much as 370,000 megawatts of electricity. These nuclear power plants can be categorized into four types: (1) light water reactors, (2) heavy water reactors, (2) gas-cooled reactors, and (4) breeder reactors. Basically, a nuclear power reactor operates by having a central unit, called the core, in which nuclear fission reactions take place and produce heat. A liquid, called the coolant, flows through the system and absorbs the heat produced in the core. The liquid is then converted into steam that drives a turbogenerator to produce electricity.

The purpose of this report is to present the basic design, operation, and safety measures of light water reactors to the city council. The city council is currently investigating the possibility of membership in a regional consortium as an alternative to increased coal-fired production of electricity. This report will explain how the two types of light water reactors, the design to be used by the consortium, operate and present the key safety and economic aspects of these reactors. Although the operations of nuclear power reactors does involve complex chemistry and physics, these aspects of the discussion have been avoided; only an introductory discussion of the mechanical operation of the reactor will be presented.

The four parts of this report discuss (1) the design and operation of pressurized water reactors, (2) the design and operation of boiling water reactors, (3) safety measures employed in these reactors, and (4) economic aspects of these reactors' operation. The sections on the two types of light water reactors will describe the components and explain their operation. The section on safety measures will discuss the causes of meltdown, safety systems used in both types of reactors, and the role of the Nuclear Regulatory Commission plays to ensure the safety of these reactors. The final section will review the various costs involved in the construction and operation of a nuclear power plant.

II. PRESSURIZED WATER REACTORS

This section of the report describes the key components of the pressurized light water reactor and explains their operation in the production of electricity.

Description of the Major Parts

In a pressurized water reactor (see Figure 1), the reactor cooling water entering the core is highly pressurized so that it remains below the boiling point. The water leaves the reactor to pass through steam generators where a secondary coolant is allowed to boil and produce steam to drive the turbine.

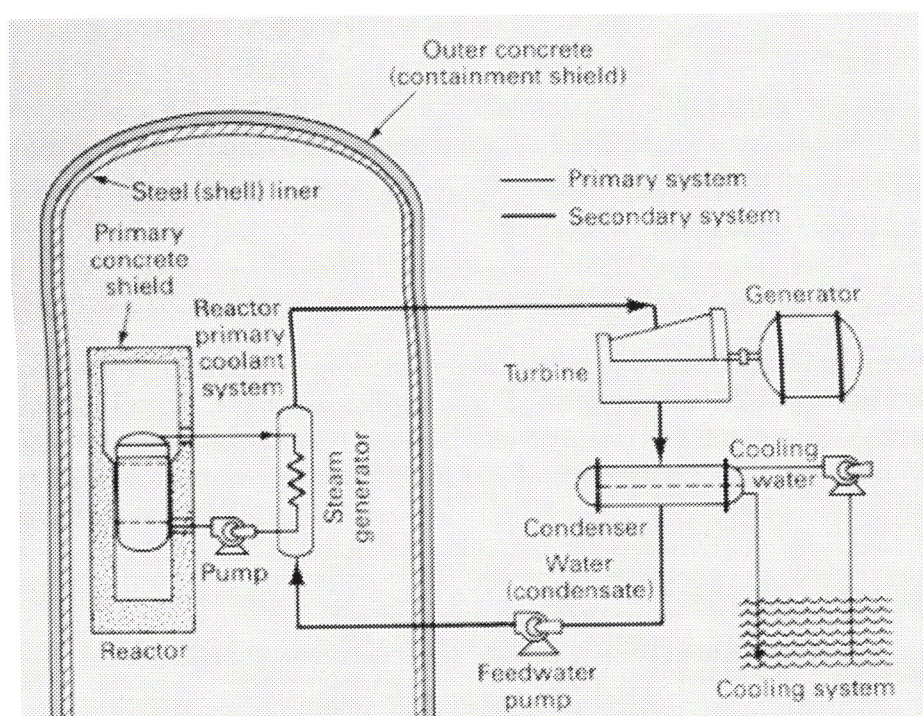


Figure 1. Schematic of a Pressurized Water Reactor. Source: Nero, Anthony V. *A Guidebook to Nuclear Reactors*, p. 78.

The key components in this process are the core, the control rods, the reactor vessel, the steam generators, and the pressurizer.

Core . The core is the active portion of the reactor providing heat to the system. The core contains fuel assemblies that contain fuel rods filled with fuel pellets.

Fuel . The fuel in the pressurized water reactor consists of cylindrical pellets of slightly enriched uranium dioxide with a diameter of 0.325 in by 0.39 in. The pellets are dished at the ends to allow for thermal expansion [12:2004].

Fuel Rod . A fuel rod consists of a cylindrical tube made of Zircalloy, a steel-gray alloy that highly resistant to corrosion. This tube is 13 ft long with an outer diameter of 0.39 in and a 0.025-in thick wall. The tube is filled with fuel pellets and is sealed [10:122].

Fuel Assembly . A fuel assembly is formed when about 230 of the fuel rods are grouped in a bundle. The fuel assembly is about 8 in on a side and 177 in long [10:122] . The reactor core is formed when about 240 of these assemblies are arranged in a cylindrical array. These assemblies are supported between upper and lower grid plates and are surrounded by a stainless steel shroud. The grid plates consist of an assembly of spring clips interlocked to form an egg-crate arrangement providing rigid support and spacing of the fuel rods [3:259].

Control Rods . Control rods provide a means of changing the amount of heat produced in the core . . . [text deleted]

3

V. ECONOMIC ASPECTS

This section presents some of the key costs that determine the economics of a nuclear power plant. These costs will be compared to those associated with other energy-producing systems, primarily those involving coal. Costs are determined by the busbar cost and the operating capacity costs.

Busbar Cost

The busbar cost is the total cost of electricity leaving the power station. The busbar cost consists of several factors: (1) construction cost, (2) operation and maintenance costs, and (3) cost of the fuel. The per-kilowatt cost of electricity estimated by the Energy Research and Development Administration, generated from 1000-megawatt nuclear, coal, and oil plants beginning operation in 1980 is as follows:

Table 1. Busbar Costs Electricity costs (in mills* Costs per kilowatt hour)			
Category	Nuclear	Coal	Oil
Capital costs	18.7	15.2	10.5
Fuel cost	5.8	13.7	25.7
Operation & maintenance costs	2.8	3.3	2.2
TOTAL	27.3	32.2	38.4
* A mill is 1/10 of a cent (\$0.001).			

Construction Cost . The construction costs include the hardware, labor, original capital borrowed, interest generated on that capital, and inflation of capital costs. The construction costs for a nuclear power plant are 18.7 mills per kilowatt hour, while those of coal are 15.2 mills per kilowatt hour [8:20] . However, there is evidence to show that complete or nearly

complete nuclear power plants cost about twice as much in real dollars than they do at the time they are ordered [1:1] . This inflation is the result of additional quality assurance, inspection, and

documentation requirements. The rise in costs can also be attributed to increases in the cost of engineering manpower and of materials such as concrete, steel, and wire [11:113] . However, the actual cost of nuclear steam supply system and the turbine generator together amount to only 15% of the total cost [11:117] . Most of the cost of a nuclear plant can be attributed to interest on capital during construction. Industry experts hope that reducing the time between initial plans for and operation of nuclear power plants will cut these costs [8:23] .

Operation and Maintenance Costs . The operation and maintenance costs for a nuclear power plant are 2.8 mills per kilowatt hour compared to 3.3 mills per kilowatt hour for a coal power plant. The difference can be attributed to recent requirements for installation of environmental protection scrubbing equipment in coal plants. Another factor . .

**APPENDIX**

INFORMATION SOURCES

1. Bupp, Irwin C., Jr., and Robert Trietel. 1976. *The Economics of Nuclear Power*. Boston: MIT.
2. Burn, Duncan. 1978. *Nuclear Power and the Energy Crisis*. New York: New York University Press.
3. Cameron, I.R. 1980. *Nuclear Fission Reactors*. New York: McGraw-Hill.
4. Glasstone, Samuel and Alexander Sesonske. *Nuclear Reactor Engineering*. Princeton, N.J.: D. Van Nostrand.
5. Kessler, G. 1983. *Nuclear Fission Reactors*. New York: Springer-Verlag Wien.
6. Lahey, R. T. and F. J. Moody. 1977. *The Thermal-Hydraulics of a Boiling Water Nuclear Reactor*. American Nuclear Society.
7. Murray, Raymond I. 1974. *Nuclear Energy*. New York: Pergamon.
8. Myers, Desaix III. 1977. *The Nuclear Power Debate*. New York: Praeger.
9. Naval Reactors Branch, Division of Reactor Development, United States Atomic Energy Commission. 1958. *The Shippingport Pressurized Water Reactor*. Reading, Mass.: Addison Wesley.
10. Nero, Anthony V. 1979. *A Guidebook to Nuclear Reactors*. Berkeley, Calif.: University of California Press.
11. The Nuclear Energy Policy Study Group. 1977. *Nuclear Power Issues and Choices*. Cambridge, Mass.: Ballinger.
12. "Nuclear Reactor." 1980 ed. *Van Nostrand's Scientific Encyclopedia*. Vol. 2.
13. Pickard, James K., ed. 1957. *Nuclear Power Reactors*. Princeton, N.J.: D. Van Nostrand.

2. Non – Economic Text

Relationship Articles

10 Tips For A More Exciting Relationship

Most relationships are very exciting in the beginning but if you have been in your current relationship for awhile already you may have noticed that the initial excitement you experienced is starting to waiver and you and your partner may be settling into a dull routine. As a relationship progresses one or both partners may be guilty of settling into complacency and may not strive to keep the element of excitement in their relationship. The following are a few tips for ensuring that your relationship stays as exciting as it was in the beginning.

Never underestimate the value of spontaneity in a relationship. Too often relationships lose their excitement because the mates fall into a routine that becomes boring as time goes by. Don't be afraid to suggest new activities in your relationship or to try new things on a whim.

Being spontaneous doesn't have to involve big decisions it can be as simple as picking up something new at the grocery store and trying a new recipe for dinner. Whatever you do, just let your instincts take over for a minute instead of relying on rationality.

Anything you do that is spontaneous may not work out as well as if you had planned out every last detail but just go with the flow and you'll find your relationship taking a turn for the better. Exploring a new location together is another way to bring the excitement back into your relationship. Whether you plan an elaborate trip to an exotic location or just take the bus to a nearby city that you have never visited your adventure together will help spice up your romance. Take your time exploring the new location and enjoy the foods and atmosphere that the new place has to offer. Exploring new cities can help bring the thrill back to your relationship.

Still another way to spice up a waning relationship is to sign up for an instructional class together such as a cooking, dancing or pottery class. Working together to learn a new skill will draw the two of you closer as you strive to accomplish a goal together. A class will enable you and your partner to interact in a new way. This new interaction will help to pull you out of a rut.

Spending a night at a hotel is another way to restore the excitement in your relationship. Intimacy is very important in a relationship and if you and your partner have found that this aspect of your relationship has lost it's spice, it's time to shake things up a bit. Choose a romantic hotel, preferably one with a cozy restaurant. Begin by having a wonderful candlelight dinner in the restaurant and then proceed to the room that you have reserved. Setting the mood with candles and dim lighting is also suggested. A night in a different location such as a romantic hotel will go a long way towards rekindling your intimate relationship.

Another way to bring the excitement back into your relationship is to set up a date night. While you may see each other daily and even go out to dinner every Friday night, setting up a

date night outside of your usual schedule will enhance your relationship. Don't just schedule a night to go out to dinner but treat each of these date nights as if they were first dates. Go all out getting yourself dressed up and take special care in your appearance. Prepare for your date night as if you were really trying to make a good first impression. Going out of your way to have at least one night of fun and romance a week will help add a little zing to your relationship.

Giving your mate gifts for no reason at all is another way to get your relationship back on track. You may have lavished gifts on your partner early in the relationship but as the relationship progressed you may not have done so as frequently. Small, meaningful gifts given just to make your partner happy will let them know that they are still always on your mind just as they were in the beginning of the relationship.

The simple act of holding hands can also add excitement back into a relationship. This intimate gesture conveys a sense of security but it also lets your partner know that you want to be close to them at all times. Many couples hold hands everywhere they go early in a relationship but don't do so later on. Try grabbing your partners hand as you are out running errands together. They will be touched by the sentiment and will be happy to be sharing a sense of closeness with you again.

A kiss is still another way to bring the excitement back into your relationship. You may have gotten into the habit of giving your mate a kiss on the cheek or a quick peck on the lips when you see them after a long day of work. Trying kissing them with passion the next time you see them to catch them by surprise and really let you know not only how much you love them but how attractive you find them as well.

Having a common interest can also promote excitement in a relationship. If there is an activity that you both enjoy doing, make it something that the two of you do together often. For example if you both enjoy hiking make plans to go hiking every Saturday morning and each time you go out make it a little different by exploring a new location or setting new goals for yourselves. This will give the two of you a chance to reconnect while enjoying each other's company. Having a ritualistic activity that you and your partner enjoy together creates closeness and intimacy that can help put the excitement back into your relationship.

Offering your partner a massage when they are worn out and tired can also bring the excitement back to your relationship. A massage can be a very sensual and intimate experience. Additionally offering a massage lets your partner know that you can see that they are stressed out and exhausted. They will appreciate your putting them first in the relationship and this will help bring back the excitement in your relationship.

Over time a relationship may lose some of the excitement that it had in the very beginning. While this may be troublesome it is also completely normal and also reversible. Noticing the lack of excitement in your relationship is the first step to restoring that excitement. It may take a little work but with a few simple actions you can be on your way to an exciting relationship.

How To Catch A Cheating Partner

If you think your partner is cheating on you and feel that you have a reason to be suspicious you may be able to do a little creative detective work on your own and find out the truth. If

you don't want to do this on your own you can also look into hiring a private investigator to follow your partner and let you know definitively whether or not your partner is cheating on you. Hiring a private investigator can be costly though so if you can do a little investigating on your own you might be able to avoid this cost.

While you may be able to investigate on your own to find your answer you should make sure that before you begin your investigation you are prepared for the answers you may receive. If you have your suspicions about your partner, you probably already realize that the relationship is in trouble but you also need to be ready for a revelation that could put an end to the relationship.

If you share credit cards or phones, these statements could become part of your investigation. Review the credit card bill each month to search for suspicious charges. Repeated hotel charges or charges to flower shops can be an indication that your spouse is cheating especially if you haven't received flowers from your partner lately and haven't spent nights in a hotel recently.

The phone bill can also give you some clues as to whether or not your partner is cheating. Be wary of frequent calls to a phone number that you do not recognize. If you find these suspicious phone charges either call the number yourself or have a friend do it.

You may find that it's a friend or relative who must have gotten a new phone number unbeknownst to you or you may find that it is someone with whom your partner is having an affair. If you call the number and find that it belongs to someone you don't know, try to get some information about their involvement with your partner without being judgmental about them. It is important to remember that this person may not even know that the person they are seeing is involved in another relationship. Another way to use credit card and phone statements as investigative tools is to ask your partner straight out about suspicious charges. If they have reason to be ashamed about the charges, their reaction will most likely give you the answers you were seeking.

Another deceptive way to catch a cheating partner is to ask questions about where they are going and take note, without their knowledge, of the mileage on the odometer before they leave and after they return. If you know where they are going you can use the Internet to determine the mileage to the location where they said they would be. When they return, make an excuse to go into the car and while you are there check the current mileage. If it doesn't match up with what you expected from your earlier investigation, confront your partner about it. If they seem to have trouble explaining where they have been, it may be an indication that they are cheating.

Asking a lot of detailed questions can be another way to catch a cheating partner. If your partner is going somewhere without you, ask questions about where they will be and who they will be with. After they leave, wait a few minutes and then try driving to the place where they had told you they would be. If you don't find their car parked where they had said they were going, this may also be an indication that your partner is cheating. Again confront them on this and see if they can offer a valid explanation for not being where they said they would be. Still another way to catch a cheating partner is to pay careful attention to details. This will allow you to pick up on inconsistencies in what your partner tells you. If you often catch them in seemingly little, white lies or if they frequently offer contradicting information about where they have been, you may have a partner who is cheating on you.

Catching a cheating partner may not be a pleasant experience but it is better to find out the truth sooner than later. As unpleasant as it may be, if you have your suspicions about your

partner cheating there is a very good chance that you have a reason to be suspicious. Whether you investigate on your own or enlist the help of a private investigator, catching a cheating partner may not be a difficult task.

Why Men Cheat

The reasons why men cheat in a relationship are often different than the reasons why women cheat. A man's reason for cheating can encompass a wide variety of reasons including genetics, a sense of challenge, self esteem and a lack of interest in their current relationship. While none are justifiable all of these can be reasons why a man chooses to stray and cheat on his current partner.

Although genetics may factor into why men cheat on their partner it may also just be a weak defense for a man who is caught in his unfaithful actions. A theory exists that testosterone levels in men make them more susceptible to infidelity.

This theory is based on the hypothesis that men are genetically predisposed to cheating because they are ingrained with the notion that the survival of the species is dependent on their procreation. While this may be true it is certainly not an excuse for unfaithfulness in our age of overpopulation.

It may be true that in prehistoric times, men were tasked with populating the earth this is certainly not true today and is not a defensible excuse for cheating on your partner. The truth is that in a truly loving relationship a man should be able to control himself and remain faithful despite any hormonal urges to produce offspring. The theory of man being predisposed to cheating does not hold water because while it may be true, there is no excuse for not being able to quell these urges.

Another reason men cheat is because they feel a sense of challenge in their infidelity. Actually being able to get away with an affair is a challenge that men enjoy. Additionally they enjoy the challenge of finding other women with which to cheat. To them the affair is more about the conquest than anything else. Sure they may enjoy the physicality of the affair, but the pursuit and sneaking around is what really drives men who cheat on their partners. They see fooling their partner as a tremendous accomplishment and they enjoy the logistics of orchestrating the affair without their partner learning of their transgressions. To them the thrill of sneaking around and the fear of being caught creates an adrenaline rush that is more important than the affair or even their current relationship. Men also cheat because they are driven by competition. If their friends are single or cheating on their partners and often have affairs with several women the man may feel that he needs to keep up with his friends. To these men affairs become a way of competing with their friends. Infidelity in men is often driven by a sense of competition.

Many men also engage in affairs because doing so is an ego boost for them. The knowledge that they can find multiple women willing to engage in an intimate relationship with them is a tremendous self esteem builder for some men. They take pride in the ability to attract women and don't care about the fact that doing so may destroy their relationship. To these men the excitement of the chase is almost more important than the conquest. Sometimes just knowing that other women find them desirable, is enough to stroke the ego of these men. In general it is a lack of self esteem on their part that drives them to seek out affairs in order to reiterate their attractiveness and desirability.

A man who is in an undesirable relationship may also be driven to cheat on their partner. If the relationship has begun to wane and the man no longer feels the same attraction to his partner he may seek out an affair out of boredom. If he feels his current relationship is lacking excitement he may also be driven to cheat in the hopes that he will find the excitement he desires elsewhere. While the wise thing may be to end the deteriorating relationship in search of a new more desirable partner, many men opt to hold onto the current relationship and engage in affairs. This may be because they fear that they may not find what they are looking for and may be left lonely and without a partner so they hold onto the failing relationship figuring that a bad relationship is better than none at all.

Men cheat for a variety of reasons. While none of these reasons may be justified, they do exist. The reasons that men cheat include genetics, competition, self esteem and boredom. In general while genetics may play a small part in the urge for men to cheat the majority of cheating takes place because men cannot control their sexual and competitive urges, are lacking in self esteem or are unhappy in their current relationship.